

CLAIMS

[0400] 1. A nano-structure composition comprising a nano-particle core and a nano-shell, where the nano-particle core comprises a first conductive material and the nano-shell comprises a second conductive material, where the first and second conductive materials are the same or different.

[0401] 2. A nano-structure composition comprising a nano-particle core and a plurality of nano-rods, where the nano-particle core comprises a first conductive material and the nano-rods comprises a third conductive material, where the first and third conductive materials are the same or different.

[0402] 3. A nano-structure composition comprising a nano-particle core, a nano-shell and a plurality of nano-rods, where the nano-particle core comprises a first conductive material, the nano-shell comprises a second conductive material and the nano-rods comprise a third conductive material, where the first, second and third conductive materials are the same or different.

[0403] 4. The composition of claims 1, 2, or 3, wherein the first conductive material is a first metal, metal alloy or a conductive polymer, the second conductive material is a second metal or metal alloy and/or the third conductive material is a third metal or metal alloy.

[0404] 5. The composition of claim 2, wherein the second metal or metal alloy is a noble metal or noble metal alloy and/or the second metal or metal alloy is a noble metal or noble metal alloy.

[0405] 6. The composition of claim 2, wherein the second and/or third metal is a gold, silver, platinum, palladium, iridium, osmium, ruthenium, or rhodium and wherein the second and/or third metal alloy is a gold, silver, platinum, palladium, iridium, osmium, ruthenium, or rhodium alloy.

[0406] 7. The composition of any of the preceding claims, wherein the first metal is a non-transition metal, transition metal, lanthanide metal or actinide metal and wherein the first metal alloy is non-transition metal, transition metal, lanthanide metal or actinide metal metal alloy.

[0407] 8. The composition of any of the preceding claims, wherein the nano-structures have a plasmon resonance.

[0408] 9. The composition of any of the preceding claims, wherein the nano-structures having a plasmon resonance at least a portion of which lie in the near infrared region of the electromagnetic spectrum.

[0409] 10. The composition of any of the preceding claims, wherein the nano-structures are electromagnetically, magnetically, electrically, and/or ultrasonically active.

[0410] 11. A nano-structure composition comprising a nano-particle core and a plurality of nano-rods, where the nano-particle core comprises a first material and the nano-rods comprises a first conductive material.

[0411] 12. A nano-structure composition comprising a nano-particle core, a nano-shell and a plurality of nano-rods, where the nano-particle core comprises a first material, the nano-shell comprises a first conductive material and the nano-rods comprise a second conductive material, where the first and second conductive materials are the same or different.

[0412] 13. A nano-structure composition comprising a nano-particle core, a nano-shell and a bio-compatible polymer coating, where the nano-particle core comprises a first material and the nano-shell comprises a first conductive material.

[0413] 14. A nano-structure composition comprising a nano-particle core, a plurality of nano-rods and a bio-compatible polymer coating, where the nano-particle core comprises a first material and the nano-rods comprises a second conductive material.

[0414] 15. A nano-structure composition comprising a nano-particle core, a nano-shell, a plurality of nano-rods and a bio-compatible polymer coating, where the nano-particle core comprises a first conductive material, the nano-shell comprises a second conductive material and the nano-rods comprise a third conductive material, where the first and second conductive materials are the same or different.

[0415] 16. The composition of claims 11, 12, 13, 14 or 15, wherein the first conductive material is a first metal, metal alloy or a conductive polymer and/or the second conductive material is a second metal or metal alloy.

[0416] 17. The composition of claim 16, wherein the first metal or metal alloy is a noble metal or noble metal alloy and/or the second metal or metal alloy is a noble metal or noble metal alloy.

[0417] 18. The composition of claim 16, wherein the first and/or second metal is a gold, silver, platinum, palladium, iridium, osmium, ruthenium, or rhodium and wherein the second and/or third metal alloy is a gold, silver, platinum, palladium, iridium, osmium, ruthenium, or rhodium alloy.

[0418] 19. The composition of claims 11, 12, 13, 14, 15, 16, 17, or 18, wherein the first material is a non-conducting material, a semi-conducting material or a conducting material.

[0419] 20. The composition of claim 19, wherein the conducting material is a non-transition metal, transition metal, lanthanide metal or actinide metal and wherein the first metal alloy is non-transition metal, transition metal, lanthanide metal or actinide metal metal alloy.

[0420] 21. The composition of claims 11, 12, 13, 14, 15, 16, 17, 81, 19 or 20, wherein the nano-structures have a plasmon resonance.

[0421] 22. The composition of claims 11, 12, 13, 14, 15, 16, 17, 81, 19 or 20, wherein the nano-structures having a plasmon resonance at least a portion of which lie in the near infrared region of the electromagnetic spectrum.

[0422] 23. The composition of claims 11, 12, 13, 14, 15, 16, 17, 81, 19 or 20, wherein the nano-structures are electromagnetically, magnetically, electrically, and/or ultrasonically active.

[0423] 24. A nano-structure drug-delivery composition comprising a nano-particle core, a nano-shell, a bio-compatible polymer coating and a pharmaceutically active agent impregnated

into the polymer coating, where the nano-particle core comprises a first material and the nano-shell comprises a first conductive material.

[0424] 25. A nano-structure drug-delivery composition comprising a nano-particle core, a plurality of nano-rods, a bio-compatible polymer coating and a pharmaceutically active agent impregnated into the polymer coating, where the nano-particle core comprises a first material and the nano-rods comprises a second conductive material.

[0425] 26. A nano-structure drug-delivery composition comprising a nano-particle core, a nano-shell, a plurality of nano-rods, a bio-compatible polymer coating and a pharmaceutically active agent impregnated into the polymer coating, where the nano-particle core comprises a first conductive material, the nano-shell comprises a second conductive material and the nano-rods comprise a third conductive material, where the first and second conductive materials are the same or different.

[0426] 27. A nano-structure drug-delivery composition comprising a nano-particle core, a nano-shell, and a pharmaceutically active agent absorbed or attached to a surface thereof, where the nano-particle core comprises a first material and the nano-shell comprises a first conductive material.

[0427] 28. A nano-structure drug-delivery composition comprising a nano-particle core, a plurality of nano-rods, and a pharmaceutically active agent absorbed or attached to a surface thereof, where the nano-particle core comprises a first material and the nano-rods comprises a second conductive material.

[0428] 29. A nano-structure drug-delivery composition comprising a nano-particle core, a nano-shell, a plurality of nano-rods, and a pharmaceutically active agent absorbed or attached to a surface thereof, where the nano-particle core comprises a first conductive material, the nano-shell comprises a second conductive material and the nano-rods comprise a third conductive material, where the first and second conductive materials are the same or different.

[0429] 30. A method for treating cancers or diseases comprising administering a nano-structure composition of claims 1-29 to an animal including a human and exposing the

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composition to an electromagnetic, magnetic, electrical and/or ultrasonic field so that the nano-structures convert the field into thermal energy.